WIX1002
Fundamentals of Programming

Chapter 7
File Input and Output

Contents

Introduction

- Files are used for **permanent storage** of large amounts of data
- **Text file** is file that **contains sequence of characters**. It is sometimes called ASCII files because the data are encoded using **ASCII coding**.
- **Binary file** stores data in binary format. The data are stored in the **sequence of bytes**.
- A stream is a flow of data. If the data flows into the program, the stream is **input stream**. If the data flows out of the program, the stream is **output stream**.

Writing to Text File

- **PrintWriter** class is used to write data to a text file.
- PrintWriter streamObject = new PrintWriter(new FileOutputStream(FileName));
- Close the file after finish writing using streamObject**.close()** method.
- The **PrintWriter, FileOutputStream and IOException** class need to be loaded using the import statement.

Writing to Text File

```
import java.io.PrintWriter;
import java.io.FileOutputStream;
import java.io.IOException;

try {
   PrintWriter outputStream = new PrintWriter(new
    FileOutputStream("data.txt"));
   …
   outputStream.close();
} catch (IOException e) {
   System.out.println(“Problem with file output");
}
```

Writing to Text File

- After the outputStream has been declared, **print, println** and **printf** can be used to write data to the text file.
- To write to the file on a specified directory,
  - PrintWriter outputStream = new PrintWriter(new FileOutputStream(**"d:/sample/data.txt"**));
- To **append** to a text file
  - To write to the end of the file,
    - PrintWriter outputStream = new PrintWriter(new FileOutputStream("d:/sample/data.txt", **true**));

Exercise

Write a program to store the exchange rate to the text file named currency.txt

USD 0.245

EUR 0.205

GBP 0.184

AUD 0.332

THB 7.41

Reading from Text File

- Two most common stream classes used for reading text file are the **Scanner** class and **BufferReader** class.
- Scanner streamObject = new Scanner (new FileInputStream(FileName));
- Close the file after finish reading using streamObject**.close()** method.
- The **FileInputStream** and **FileNotFoundException** class need to be loaded using the import statement.

Reading from Text File

```
import java.util.Scanner;
import java.io.FileInputStream;
import java.io.FileNotFoundException;

try {
   Scanner inputStream = new Scanner(new
    FileInputStream("data.txt"));
   …
   inputStream.close();
} catch (FileNotFoundException e) {
   System.out.println("File was not found");
}
```

Reading from Text File

- After the inputStream has been declared, **nextInt, nextDouble, nextLine** can be used to read data from the text file.

  String input = inputStream.nextLine();

  int num1 = inputStream.nextInt();

  double num2 = inputStream.nextDouble();
- To check for the end of a text file
  - while (**inputStream.hasNextLine()**)
- To open file from a specified directory
  - Scanner inputStream = new Scanner(new FileInputStream(**"d:/sample/data.txt"**));

Reading from Text File

- BufferedReader class is another class that can read text from the text file.
- BufferedReader inputStream = new BufferedReader(new FileReader(FileName));
- Close the file after finish reading using streamObject**.close()** method.
- The **BufferedReader**, **FileReader** and **FileNotFoundException, IOException** class need to be loaded using the import statement.

Reading from Text File

```
import java.io.BufferedReader;
import java.io.FileReader;
import java.io.FileNotFoundException;
import java.io.IOException;
try {
   BufferedReader inputStream = new BufferedReader (new
     FileReader("data.txt"));
   …
   inputStream.close();
} catch (FileNotFoundException e) {
   System.out.println("File was not found");
} catch (IOException e) {
   System.out.println(“Error reading from file");
}
```

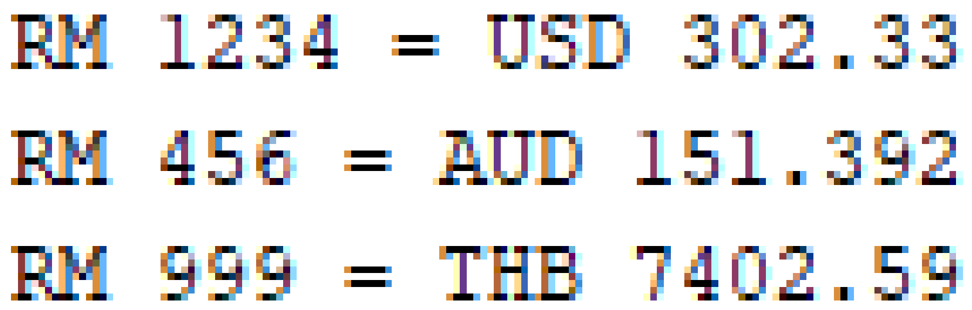
Reading from Text File

- After the inputStream has been declared, **read** and **readLine** can be used to read data from the text file.

  String input = inputStream.readLine();
- To check for the end of a text file
  - while (**(input=inputStream.readLine()) != null**)
- To open file from a specified directory
  - BufferedReader inputStream = new BufferedReader(new FileReader("d:/sample/data.txt"));

Exercise

Write a program to read the exchange rate from currency.txt and compute the exchange rate



```
RM 1234 = USD 302.33
RM 456 = AUD 151.392
RM 999 = THB 7402.59
```

File Class

- File class contains methods that used to check the **properties of the file**.
- The file class is loaded using **import java.io.File;**

```
File fileObject = new File("data.txt");
if (fileObject.exists()) {
   System.out.println("The file is already exists");
   fileObject.renameTo("data1.txt");
}
if (fileObject.canRead())
   System.out.println("The file is readable");
if (fileObject.canWrite())
   System.out.println("The file is writable");
```

Writing to Binary File

- **ObjectOutputStream** is the stream class that used to write data to a binary file.
- ObjectOutputStream streamObject = new ObjectOutputStream (new FileOutputStream(FileName));
- The **ObjectOutputStream, FileOutputStream and IOException** class need to be loaded using the import statement.
- The **writeInt, writeDouble, writeChar, writeBoolean** can be used to write the value of different variable type to the output stream. Use **writeUTF** to write String object to the output stream.
- Close the file after finish writing using streamObject**.close()** method.

Writing to Binary File

```
import java.io.IOException;
import java.io.ObjectOutputStream;
import java.io.FileOutputStream;
try {
   ObjectOutputStream outputStream = new
    ObjectOutputStream (new FileOutputStream("data.dat"));
   …
   outputStream.close();
} catch (IOException e) {
   System.out.println("Problem with file output.");
}
```

Reading from Binary File

- **ObjectInputStream** is the stream class that used to read a binary file written using **ObjectOutputStream**
- ObjectInputStream streamObject = new ObjectInputStream (new FileInputStream(FileName));
- The **ObjectInputStream, FileInputStream and IOException, FileNotFoundException** class need to be loaded using the import statement.
- The **readInt, readDouble, readChar, readBoolean** can be used to read the value from the input stream. Use **readUTF** to read String object from the input stream.
- Close the file after finish writing using streamObject**.close()** method.

Reading from Binary File

```
import java.io.IOException;
import java.io.FileNotFoundException;
import java.io.ObjectInputStream;
import java.io.FileOutputStream;
try {
   ObjectInputStream inputStream = new ObjectInputStream (new
     FileInputStream("data.dat"));
   …
   inputStream.close();
} catch (FileNotFoundException e) {
   System.out.println("File was not found");
} catch (IOException e) {
   System.out.println("Problem with file input.");
}
```

Reading from Binary File

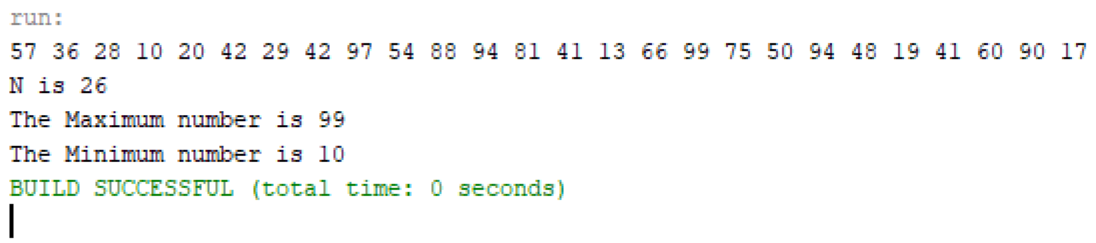
- To check for the end of a text file
  - Use **EOFException**

```
try {
   while(true) {
      number = inputStream.readInt();
   }
} catch (EOFException e) { }
```

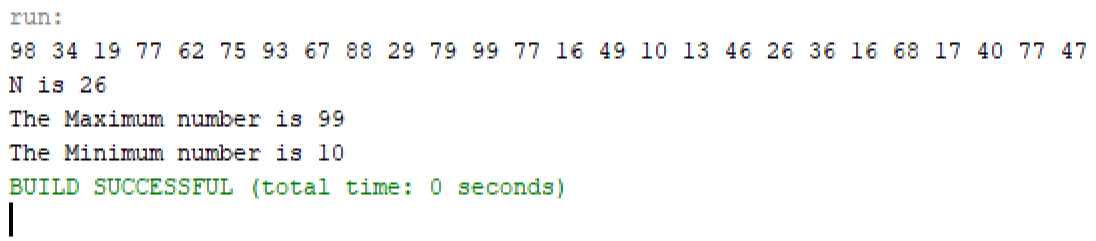
Exercise

- Generate N random numbers within 10-100, N is within (20-30) and then store in a binary file number.dat.

- Read all the random numbers from number.dat
- Display all the numbers, N, maximum and minimum



```
run:
57 36 28 10 20 42 29 42 97 54 88 94 81 41 13 66 99 75 50 94 48 19 41 60 90 17
N is 26
The Maximum number is 99
The Minimum number is 10
BUILD SUCCESSFUL (total time: 0 seconds)
```



```
run:
98 34 19 77 62 75 93 67 88 29 79 99 77 16 49 10 13 46 26 36 16 68 17 40 77 47
N is 26
The Maximum number is 99
The Minimum number is 10
BUILD SUCCESSFUL (total time: 0 seconds)
```

Read files from directory

```
package readfiles;
import java.io.File;

public class ReadFiles {
    public static void main(String[] args) {
        File folder = new File("FilesFolder");
        File[] listOfFiles = folder.listFiles();

        if (listOfFiles != null) {
            for (File file : listOfFiles) {
                if (file.isFile()) {
                    System.out.println(file.getName());
                }
            }
        } else {
            System.out.println("The directory is empty or not a 
directory.");
        }
    }
}
```

https://www.geeksforgeeks.org/how-to-list-all-files-in-a-directory-in-java/

Read content from files

Homework : Create a program that read files (txt and csv) from a directory and following by reading content of each file. You may create random contents in each file.

Example filename :

- exampleText1.txt
- exampleText2.txt
- exampleCSV.csv

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